



SEQUENCE LISTING

<110> HANSEN, HANS J.
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MCBRIDE, WILLIAM J.
LEUNG, SHUI-ON
QU, ZHENGXING

<120> PRODUCTION AND USE OF NOVEL PEPTIDE-BASED AGENTS FOR
USE WITH BI-SPECIFIC ANTIBODIES

<130> 40923-0074US4

<140> 09/823,746

<141> 2001-04-03

<150> 09/337,756

<151> 1999-06-22

<160> 18

<170> PatentIn Ver. 3.3

<210> 1

<211> 339

<212> DNA

<213> Artificial Sequence

<220>

<221> CDS

<222> (1)..(339)

<220>

<223> Description of Artificial Sequence: Synthetic 679 Vb
nucleotide sequence

<400> 1

gac	att	gtg	atg	tca	caa	tct	cca	tcc	tcc	ctg	gct	gtg	tca	cca	gga	48
Asp	Ile	Val	Met	Ser	Gln	Ser	Pro	Ser	Ser	Leu	Ala	Val	Ser	Pro	Gly	
1				5					10					15		

gag	aag	gtc	act	atg	acc	tgc	aaa	tcc	agt	cag	agt	ctg	ttc	aac	agt	96
Glu	Lys	Val	Thr	Met	Thr	Cys	Lys	Ser	Ser	Gln	Ser	Leu	Phe	Asn	Ser	
			20					25					30			

aga	acc	cga	aag	aac	tac	ttg	ggg	tgg	tac	cag	cag	aaa	cca	ggg	cag	144
Arg	Thr	Arg	Lys	Asn	Tyr	Leu	Gly	Trp	Tyr	Gln	Gln	Lys	Pro	Gly	Gln	
			35				40					45				

tct	cct	aaa	ctt	ctg	atc	tac	tgg	gca	tct	act	cgg	gaa	tct	ggg	gtc	192
Ser	Pro	Lys	Leu	Leu	Ile	Tyr	Trp	Ala	Ser	Thr	Arg	Glu	Ser	Gly	Val	
		50				55					60					

cct	gat	cgc	ttc	aca	ggc	agt	gga	tct	ggg	aca	gat	ttc	act	ctc	acc	240
Pro	Asp	Arg	Phe	Thr	Gly	Ser	Gly	Ser	Gly	Thr	Asp	Phe	Thr	Leu	Thr	
	65				70					75					80	

2

atc	aac	agt	gtg	cag	tct	gaa	gac	ctg	gca	gtt	tat	tac	tgc	act	caa	288
Ile	Asn	Ser	Val	Gln	Ser	Glu	Asp	Leu	Ala	Val	Tyr	Tyr	Cys	Thr	Gln	
			85						90					95		

gtt	tat	tat	ctg	tgc	acg	ttc	ggg	gct	ggg	acc	aag	ctg	gag	ctg	aaa	336
Val	Tyr	Tyr	Leu	Cys	Thr	Phe	Gly	Ala	Gly	Thr	Lys	Leu	Glu	Leu	Lys	
			100					105					110			

cgg																339
Arg																

<210> 2
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Synthetic 679 Vb
 amino acid sequence

<400> 2																
Asp	Ile	Val	Met	Ser	Gln	Ser	Pro	Ser	Ser	Leu	Ala	Val	Ser	Pro	Gly	
1				5					10					15		
Glu	Lys	Val	Thr	Met	Thr	Cys	Lys	Ser	Ser	Gln	Ser	Leu	Phe	Asn	Ser	
			20					25					30			
Arg	Thr	Arg	Lys	Asn	Tyr	Leu	Gly	Trp	Tyr	Gln	Gln	Lys	Pro	Gly	Gln	
		35					40					45				
Ser	Pro	Lys	Leu	Leu	Ile	Tyr	Trp	Ala	Ser	Thr	Arg	Glu	Ser	Gly	Val	
	50				55					60						
Pro	Asp	Arg	Phe	Thr	Gly	Ser	Gly	Ser	Gly	Thr	Asp	Phe	Thr	Leu	Thr	
	65			70					75					80		
Ile	Asn	Ser	Val	Gln	Ser	Glu	Asp	Leu	Ala	Val	Tyr	Tyr	Cys	Thr	Gln	
			85						90					95		
Val	Tyr	Tyr	Leu	Cys	Thr	Phe	Gly	Ala	Gly	Thr	Lys	Leu	Glu	Leu	Lys	
			100					105					110			

Arg

<210> 3
 <211> 354
 <212> DNA
 <213> Artificial Sequence

<220>
 <221> CDS
 <222> (1) .. (354)

<220>

<223> Description of Artificial Sequence: Synthetic 679 Vh
nucleotide sequence

<400> 3

gtc	caa	ctg	cag	gag	tca	ggg	gga	gac	tta	gtg	aag	cct	gga	ggg	tcc	48
Val	Gln	Leu	Gln	Glu	Ser	Gly	Gly	Asp	Leu	Val	Lys	Pro	Gly	Gly	Ser	
1				5				10						15		
ctg	aaa	ctc	tcc	tgt	gca	gcc	tct	gga	ttc	act	ttc	agt	att	tac	acc	96
Leu	Lys	Leu	Ser	Cys	Ala	Ala	Ser	Gly	Phe	Thr	Phe	Ser	Ile	Tyr	Thr	
			20					25					30			
atg	tct	tgg	ctt	cgc	cag	act	ccg	gaa	aag	agg	ctg	gag	tgg	gtc	gca	144
Met	Ser	Trp	Leu	Arg	Gln	Thr	Pro	Glu	Lys	Arg	Leu	Glu	Trp	Val	Ala	
		35					40					45				
acc	ctg	agt	ggg	gat	ggg	gat	gac	atc	tac	tat	cca	gac	agt	gtg	aag	192
Thr	Leu	Ser	Gly	Asp	Gly	Asp	Asp	Ile	Tyr	Tyr	Pro	Asp	Ser	Val	Lys	
	50					55					60					
ggg	cga	ttc	acc	atc	tcc	aga	gac	aat	gcc	aag	aac	aac	cta	tat	ctg	240
Gly	Arg	Phe	Thr	Ile	Ser	Arg	Asp	Asn	Ala	Lys	Asn	Asn	Leu	Tyr	Leu	
65					70				75					80		
caa	atg	aac	agt	cta	agg	tct	gcg	gac	acg	gcc	ttg	tat	tac	tgt	gca	288
Gln	Met	Asn	Ser	Leu	Arg	Ser	Ala	Asp	Thr	Ala	Leu	Tyr	Tyr	Cys	Ala	
				85				90						95		
agg	gtg	cga	ctt	ggg	gac	tgg	gac	ttc	gat	gtc	tgg	ggc	cca	ggg	acc	336
Arg	Val	Arg	Leu	Gly	Asp	Trp	Asp	Phe	Asp	Val	Trp	Gly	Pro	Gly	Thr	
			100					105					110			
acg	gtc	tcc	gtc	tcc	tca											354
Thr	Val	Ser	Val	Ser	Ser											
			115													

<210> 4

<211> 118

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic 679 Vh
amino acid sequence

<400> 4

Val	Gln	Leu	Gln	Glu	Ser	Gly	Gly	Asp	Leu	Val	Lys	Pro	Gly	Gly	Ser
1				5				10						15	
Leu	Lys	Leu	Ser	Cys	Ala	Ala	Ser	Gly	Phe	Thr	Phe	Ser	Ile	Tyr	Thr
			20					25					30		
Met	Ser	Trp	Leu	Arg	Gln	Thr	Pro	Glu	Lys	Arg	Leu	Glu	Trp	Val	Ala
		35					40					45			

Thr Leu Ser Gly Asp Gly Asp Asp Ile Tyr Tyr Pro Asp Ser Val Lys
 50 55 60
 Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Asn Leu Tyr Leu
 65 70 75 80
 Gln Met Asn Ser Leu Arg Ser Ala Asp Thr Ala Leu Tyr Tyr Cys Ala
 85 90 95
 Arg Val Arg Leu Gly Asp Trp Asp Phe Asp Val Trp Gly Pro Gly Thr
 100 105 110
 Thr Val Ser Val Ser Ser
 115

<210> 5
 <211> 741
 <212> DNA
 <213> Artificial Sequence

<220>
 <221> CDS
 <222> (1)..(741)

<220>
 <223> Description of Artificial Sequence: Synthetic scFv of
 Mab 679

<400> 5
 gac att gtg atg tca caa tct cca tcc tcc ctg gct gtg tca cca gga 48
 Asp Ile Val Met Ser Gln Ser Pro Ser Ser Leu Ala Val Ser Pro Gly
 1 5 10 15
 gag aag gtc act atg acc tgc aaa tcc agt cag agt ctg ttc aac agt 96
 Glu Lys Val Thr Met Thr Cys Lys Ser Ser Gln Ser Leu Phe Asn Ser
 20 25 30
 aga acc cga aag aac tac ttg ggt tgg tac cag cag aaa cca ggg cag 144
 Arg Thr Arg Lys Asn Tyr Leu Gly Trp Tyr Gln Gln Lys Pro Gly Gln
 35 40 45
 tct cct aaa ctt ctg atc tac tgg gca tct act cgg gaa tct ggg gtc 192
 Ser Pro Lys Leu Leu Ile Tyr Trp Ala Ser Thr Arg Glu Ser Gly Val
 50 55 60
 cct gat cgc ttc aca ggc agt gga tct ggg aca gat ttc act ctc acc 240
 Pro Asp Arg Phe Thr Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr
 65 70 75 80
 atc aac agt gtg cag tct gaa gac ctg gca gga ggc tcc gga ggc ggt 288
 Ile Asn Ser Val Gln Ser Glu Asp Leu Ala Gly Gly Ser Gly Gly Gly
 85 90 95
 ggg agt gag gtg cag ctg cag gag tct ggg gga gac tta gtg aag cct 336
 Gly Ser Glu Val Gln Leu Gln Glu Ser Gly Gly Asp Leu Val Lys Pro
 100 105 110

```

gga ggg tcc ctg aaa ctc tcc tgt gca gcc tct gga ttc act ttc agt 384
Gly Gly Ser Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser
      115                      120                      125

att tac acc atg tct tgg ctt cgc cag act ccg gaa aag agg ctg gag 432
Ile Tyr Thr Met Ser Trp Leu Arg Gln Thr Pro Glu Lys Arg Leu Glu
      130                      135                      140

tgg gtc gca acc ctg agt gtt tat tac tgc act caa gtt tat tat ctg 480
Trp Val Ala Thr Leu Ser Val Tyr Tyr Cys Thr Gln Val Tyr Tyr Leu
145                      150                      155                      160

tgc acg ttc ggt gct ggg acc aag ctg gag ctg aaa cga gga ggt ggc 528
Cys Thr Phe Gly Ala Gly Thr Lys Leu Glu Leu Lys Arg Gly Gly Gly
      165                      170                      175

gga tca gga ggc ggt gat ggt gat gac atc tac tat cca gac agt gtg 576
Gly Ser Gly Gly Gly Asp Gly Asp Asp Ile Tyr Tyr Pro Asp Ser Val
      180                      185                      190

aag ggt cga ttc acc atc tcc aga gac aat gcc aag aac aac cta tat 624
Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Asn Leu Tyr
      195                      200                      205

ctg caa atg aac agt cta agg tct gcg gac acg gcc ttg tat tac tgt 672
Leu Gln Met Asn Ser Leu Arg Ser Ala Asp Thr Ala Leu Tyr Tyr Cys
      210                      215                      220

gca agg gtg cga ctt ggg gac tgg gac ttc gat gtc tgg ggc caa ggg 720
Ala Arg Val Arg Leu Gly Asp Trp Asp Phe Asp Val Trp Gly Gln Gly
225                      230                      235                      240

acc acg gtc acc gtc tcc tca
Thr Thr Val Thr Val Ser Ser
      245

```

<210> 6

<211> 247

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic scFv of
Mab 679

<400> 6

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Asp Ile Val Met Ser Gln Ser Pro Ser Ser Leu Ala Val Ser Pro Gly
  1                      5                      10                      15

Glu Lys Val Thr Met Thr Cys Lys Ser Ser Gln Ser Leu Phe Asn Ser
      20                      25                      30

Arg Thr Arg Lys Asn Tyr Leu Gly Trp Tyr Gln Gln Lys Pro Gly Gln
      35                      40                      45

```

Ser Pro Lys Leu Leu Ile Tyr Trp Ala Ser Thr Arg Glu Ser Gly Val
 50 55 60
 Pro Asp Arg Phe Thr Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr
 65 70 75 80
 Ile Asn Ser Val Gln Ser Glu Asp Leu Ala Gly Gly Ser Gly Gly Gly
 85 90 95
 Gly Ser Glu Val Gln Leu Gln Glu Ser Gly Gly Asp Leu Val Lys Pro
 100 105 110
 Gly Gly Ser Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser
 115 120 125
 Ile Tyr Thr Met Ser Trp Leu Arg Gln Thr Pro Glu Lys Arg Leu Glu
 130 135 140
 Trp Val Ala Thr Leu Ser Val Tyr Tyr Cys Thr Gln Val Tyr Tyr Leu
 145 150 155 160
 Cys Thr Phe Gly Ala Gly Thr Lys Leu Glu Leu Lys Arg Gly Gly Gly
 165 170 175
 Gly Ser Gly Gly Gly Asp Gly Asp Asp Ile Tyr Tyr Pro Asp Ser Val
 180 185 190
 Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Asn Leu Tyr
 195 200 205
 Leu Gln Met Asn Ser Leu Arg Ser Ala Asp Thr Ala Leu Tyr Tyr Cys
 210 215 220
 Ala Arg Val Arg Leu Gly Asp Trp Asp Phe Asp Val Trp Gly Gln Gly
 225 230 235 240
 Thr Thr Val Thr Val Ser Ser
 245

<210> 7

<211> 336

<212> DNA

<213> Artificial Sequence

<220>

<221> CDS

<222> (1)..(336)

<220>

<223> Description of Artificial Sequence: Synthetic Mu-9V
nucleotide sequence

<400> 7

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gct gtt ttg atg acc caa act cca ctc tcc ctg cct gtc agt ctt gga      48
Ala Val Leu Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
  1              5              10              15

gat caa gcc tcc atc tct tgc aga tct agt cag agc att gtc cat agt      96
Asp Gln Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
              20              25              30

aat ggc aac acc tat tta gaa tgg tac ctg cag aaa cca ggc cag tct      144
Asn Gly Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
              35              40              45

cca aag ctc ctg atc tac aaa gtt tcc aac cga ttt tct ggg gtc cca      192
Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
              50              55              60

gac agg ttc agt ggc act gga tca ggg aca gat ttc aca gtc agg atc      240
Asp Arg Phe Ser Gly Thr Gly Ser Gly Thr Asp Phe Thr Val Arg Ile
              65              70              75              80

agc aga gtg gag gct gag gat ctg gga ctt tat tac tgc ttt caa ggt      288
Ser Arg Val Glu Ala Glu Asp Leu Gly Leu Tyr Tyr Cys Phe Gln Gly
              85              90              95

tca cgt gtt ccg tac acg ttc gga ggg ggg acc aag ctg gaa ata aaa      336
Ser Arg Val Pro Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
              100              105              110

```

<210> 8

<211> 112

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic Mu-9V amino acid sequence

<400> 8

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Ala Val Leu Met Thr Gln Thr Pro Leu Ser Leu Pro Val Ser Leu Gly
  1              5              10              15

Asp Gln Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
              20              25              30

Asn Gly Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ser
              35              40              45

Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
              50              55              60

Asp Arg Phe Ser Gly Thr Gly Ser Gly Thr Asp Phe Thr Val Arg Ile
              65              70              75              80

Ser Arg Val Glu Ala Glu Asp Leu Gly Leu Tyr Tyr Cys Phe Gln Gly
              85              90              95

```

Ser Arg Val Pro Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
 100 105 110

<210> 9
 <211> 333
 <212> DNA
 <213> Artificial Sequence

<220>
 <221> CDS
 <222> (1)..(333)

<220>
 <223> Description of Artificial Sequence: Synthetic Mu-9Vh
 nucleotide sequence

<400> 9
 gtg cag ctg cag gag tca gga cct gag ctg gtg aag cct ggg gct tca 48
 Val Gln Leu Gln Glu Ser Gly Pro Glu Leu Val Lys Pro Gly Ala Ser
 1 5 10 15
 gtg aag atg tcc tgc agg gct tct gga tac acc ttc act gag tat gtt 96
 Val Lys Met Ser Cys Arg Ala Ser Gly Tyr Thr Phe Thr Glu Tyr Val
 20 25 30
 att acc tgg gta aaa cag aga act gga cag ggc ctt gag tgg att gga 144
 Ile Thr Trp Val Lys Gln Arg Thr Gly Gln Gly Leu Glu Trp Ile Gly
 35 40 45
 gag att tat cct gga agt ggt agt act tcc tac aat gaa aag ttc aag 192
 Glu Ile Tyr Pro Gly Ser Gly Ser Thr Ser Tyr Asn Glu Lys Phe Lys
 50 55 60
 ggc aag gcc aca ctg act gca gac aaa tcc tcc aac aca gcc tac atg 240
 Gly Lys Ala Thr Leu Thr Ala Asp Lys Ser Ser Asn Thr Ala Tyr Met
 65 70 75 80
 cac ctc agc agc ctg aca tct gag gac tct gcg gtc tat ttc tgt aca 288
 His Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Phe Cys Thr
 85 90 95
 aga gag gat ctt ggg ggc caa ggg act ctg gtc act gtc tct tca 333
 Arg Glu Asp Leu Gly Gly Gln Gly Thr Leu Val Thr Val Ser Ser
 100 105 110

<210> 10
 <211> 111
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Synthetic Mu-9Vh amino
 acid sequence

<400> 10

Val Gln Leu Gln Glu Ser Gly Pro Glu Leu Val Lys Pro Gly Ala Ser
 1 5 10 15

Val Lys Met Ser Cys Arg Ala Ser Gly Tyr Thr Phe Thr Glu Tyr Val
 20 25 30

Ile Thr Trp Val Lys Gln Arg Thr Gly Gln Gly Leu Glu Trp Ile Gly
 35 40 45

Glu Ile Tyr Pro Gly Ser Gly Ser Thr Ser Tyr Asn Glu Lys Phe Lys
 50 55 60

Gly Lys Ala Thr Leu Thr Ala Asp Lys Ser Ser Asn Thr Ala Tyr Met
 65 70 75 80

His Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Phe Cys Thr
 85 90 95

Arg Glu Asp Leu Gly Gly Gln Gly Thr Leu Val Thr Val Ser Ser
 100 105 110

<210> 11

<211> 333

<212> DNA

<213> Artificial Sequence

<220>

<221> CDS

<222> (1)..(333)

<220>

<223> Description of Artificial Sequence: Synthetic humanized
 Mu-9 nucleotide sequence

<400> 11

gat atc cag ctg acc caa tcc cca ggc acc ctg tcc ctc agt cct gga 48
 Asp Ile Gln Leu Thr Gln Ser Pro Gly Thr Leu Ser Leu Ser Pro Gly
 1 5 10 15

gag cga gcc act ctg tct tgc agg tct agt cag agc att gtg cat agt 96
 Glu Arg Ala Thr Leu Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
 20 25 30

aat ggc aac acc tat tta gaa tgg tac ctg cag aaa cca ggc cag gct 144
 Asn Gly Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ala
 35 40 45

cca agg ctc ctg atc tac aaa gtt tcc aac cga ttt tcc gga gtc cca 192
 Pro Arg Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
 50 55 60

gac agg ttc agt ggc tct gga tca ggg aca gat ttc aca ctt act atc 240
 Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile
 65 70 75 80

```

agc aga ctg gag cct gag gat ttt gct gtg tat tac tgc ttt caa ggt      288
Ser Arg Leu Glu Pro Glu Asp Phe Ala Val Tyr Tyr Cys Phe Gln Gly
                85                      90                      95

```

```

tca cgt gtt ccg tac acg ttc gga ggg ggg acc aag gtg gag atc      333
Ser Arg Val Pro Tyr Thr Phe Gly Gly Gly Thr Lys Val Glu Ile
                100                      105                      110

```

<210> 12

<211> 111

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic humanized
Mu-9 amino acid sequence

<400> 12

```

Asp Ile Gln Leu Thr Gln Ser Pro Gly Thr Leu Ser Leu Ser Pro Gly
  1                5                10                15

```

```

Glu Arg Ala Thr Leu Ser Cys Arg Ser Ser Gln Ser Ile Val His Ser
                20                25                30

```

```

Asn Gly Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro Gly Gln Ala
  35                40                45

```

```

Pro Arg Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser Gly Val Pro
  50                55                60

```

```

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile
  65                70                75                80

```

```

Ser Arg Leu Glu Pro Glu Asp Phe Ala Val Tyr Tyr Cys Phe Gln Gly
                85                90                95

```

```

Ser Arg Val Pro Tyr Thr Phe Gly Gly Gly Thr Lys Val Glu Ile
  100                105                110

```

<210> 13

<211> 333

<212> DNA

<213> Artificial Sequence

<220>

<221> CDS

<222> (1)..(333)

<220>

<223> Description of Artificial Sequence: Synthetic humanized
Mu-9 heavy chain variable region nucleotide sequence

<400> 13

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gtg cag ctg cag cag tca gga gct gag gtg aaa aag cct ggg agc tca 48
Val Gln Leu Gln Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser Ser
  1             5             10             15

gtg aag gtc tcc tgc aag gct tct gga tac acc ttc act gag tat gtt 96
Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Glu Tyr Val
             20             25             30

att acc tgg gta aaa cag aga cct gga cag ggt cta gag tgg att gga 144
Ile Thr Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile Gly
             35             40             45

gag att tat cct gga agt ggt agt act tcc tac aat gaa aag ttc aag 192
Glu Ile Tyr Pro Gly Ser Gly Ser Thr Ser Tyr Asn Glu Lys Phe Lys
             50             55             60

ggc aag gcc aca atc act gct gac aaa tcc act aac aca gcc tac atg 240
Gly Lys Ala Thr Ile Thr Ala Asp Lys Ser Thr Asn Thr Ala Tyr Met
             65             70             75             80

gag ctc agc agc ctg aga tct gag gac act gcg ttc tat ttc tgt aca 288
Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Phe Tyr Phe Cys Thr
             85             90             95

aga gag gat ctt ggg ggc caa ggg tct ctg gtc acc gtc tct tca 333
Arg Glu Asp Leu Gly Gly Gln Gly Ser Leu Val Thr Val Ser Ser
             100             105             110

```

<210> 14

<211> 111

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic humanized
Mu-9 heavy chain variable region amino acid sequence

<400> 14

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Val Gln Leu Gln Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser Ser
  1             5             10             15

Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Glu Tyr Val
             20             25             30

Ile Thr Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile Gly
             35             40             45

Glu Ile Tyr Pro Gly Ser Gly Ser Thr Ser Tyr Asn Glu Lys Phe Lys
             50             55             60

Gly Lys Ala Thr Ile Thr Ala Asp Lys Ser Thr Asn Thr Ala Tyr Met
             65             70             75             80

Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Phe Tyr Phe Cys Thr
             85             90             95

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Arg Glu Asp Leu Gly Gly Gln Gly Ser Leu Val Thr Val Ser Ser
 100 105 110

<210> 15
 <211> 4
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Synthetic peptide

<220>
 <221> MOD_RES
 <222> (2)
 <223> Lys (HSG)

<220>
 <221> MOD_RES
 <222> (4)
 <223> Lys (HSG)

<220>
 <223> c-term amidated

<400> 15
 Phe Lys Tyr Lys
 1

<210> 16
 <211> 4
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Synthetic peptide

<220>
 <221> MOD_RES
 <222> (1)
 <223> Ac-Lys (DTPA)

<220>
 <221> MOD_RES
 <222> (3)
 <223> Lys (DTPA)

<220>
 <221> MOD_RES
 <222> (4)
 <223> Lys(Tscg-Cys); Cys not part of peptide backbone

<220>
 <223> c-term amidated

<400> 16
Lys Tyr Lys Lys
1

<210> 17
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: GlySer linker
peptide

<400> 17
Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser
1 5 10 15

<210> 18
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic peptide

<400> 18
Phe Lys Tyr Lys
1